BUKHTIY, ANATOLIY SEMENOVICH

Elektrolit alyuminiyevykh vann. Moskva,

198 [17] p. illus., graphs, tables.

Bibliography: p. 19[illegible]-[199]

S/149/61/000/001/002/013
A006/A001

AUTHORS: Zhemchuzhina, Ye.A., Belyayev, A.I., Gavrilov, O.R., Drashar, Ya.

TITLE: The Effect of Magnesium Oxide on the Properties of Electrolyte in Aluminum Cells

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, 1961, No. 1, pp. 71 - 76

TEXT: It was previously established that the presence of magnesium fluoride (MgF_2) in the electrolyte of aluminum cells had a favorable effect on electrolysis. Practically, however, magnesium oxide in the form of caustic or metallurgical magnesite ($MgCO_3$), roasted at 700 or 1,200°C, is used instead of MgF_2. The authors studied the effect of magnesium oxide on the fusibility, surface properties and the cryolitic ratio of the electrolyte of aluminum cells. The fusibility of cryolite melts was studied by determining the temperature of beginning crystallization of melts using thermal analysis at a cooling rate of 2 - 4° per minute. The temperature of beginning crystallization of $NaF+AlF_3$ melts was investigated after dissolving in them a maximum amount of magnesite within one hour at 1,010°C. Data obtained show that a drop of temperature of beginning crystalliza-

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The Effect of Magnesium Oxide on the Properties of Electrolyte in Aluminum Cells

tion was observed in all cases when roasted magnesite or pure magnesium oxide were added to the $NaF+AlF_3$ melts. Temperature curves of beginning crystallization of these melts with and without addition of MgF_2 were located much higher than liquidus lines of melts containing magnesium oxide. The drop of temperature under the effect of MgO is obviously caused by the decomposition of a portion of cryolite by magnesium oxide according to the reaction: $2Na_3AlF_6 + 3MgO \rightarrow 3MgF_2 + 6NaF + Al_2O_3$ (1). Changes in the wetting contact angles and surface properties were established by measuring the contact angles at 1,010°C of $NaF+AlF_3$ melts with a cryolitic ratio of 2.2; 2.4; 2.5; 2.6 and 2.7, containing roasted magnesite in an amount capable of being dissolved within 1 hour at the given temperature. It was found that the contact angles increased with a higher cryolitic ratio. This was obviously caused by the increased solubility of both caustic and metallurgical magnesite due to a higher cryolitic ratio and due to a stronger effect of surface-active complex MgF_3^- ions forming mainly in less acid melts $Na_3AlF_6 + 3MgF_2 = 3NaMgF_3 + AlF_3$ (2) and reducing the activity of Na^+ ions. To compare the effect of MgF_3 and MgO additions on changes in the contact angles and consequently on the interfacial tension of $NaF+AlF_3$ melts on the border with carbon, the contact angles of these melts were measured at a different cryolitic ratio in the presence of 5

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The Effect of Magnesium Oxide on the Properties of Electrolyte in Aluminum Cells

weight % caustic magnesite or 5% MgF_2. It was found that in melts with a cryolitic ratio equal to 2.5; 2.6 and 2.7, the addition of MgO had a lesser effect on the increase of interfacial tension than MgF_2. The degree of changes in the electrolyte cryolitic ratio after addition of MgO, was investigated by melting in a corundum crucible at 1,000°C, 35 g $NaF+AlF_3$ salt mixture with a definite cryolitic ratio, containing 5 weight % Al_2O_3 and a given amount of MgO. The cryolitic ratio of the melt was determined by calculation and by titration with sodium fluoride. The calculation was based on the full interaction of the whole magnesium oxide according to reaction (3): $3MgO + 2AlF_3 \rightarrow 3MgF_2 + Al_2O_3$. The calculation of the cryolitic ratio after titration was made by the formula $\frac{3a - 2b}{a + b}$ where a is the electrolyte batch in g, and b is the NaF weight in g used for titration. In all cases, when adding MgO to the cryolite-alumina melt, an increase in the cryolitic ratio was observed. Dissimilar data on changes of this ratio, being determined by hot titration and by calculation, show that more complicated processes than a simple interaction of MgO with AlF_3 take place in the $NaF + AlF_3$ melt when MgO is introduced. This may result from reaction(3) and from the interaction of magnesium

The Effect of Magnesium Oxide on the Properties of Electrolyte in Aluminum Cells

fluoride with cryolite which is accompanied by the formation of AlF_3 in the melt according to reaction (2).

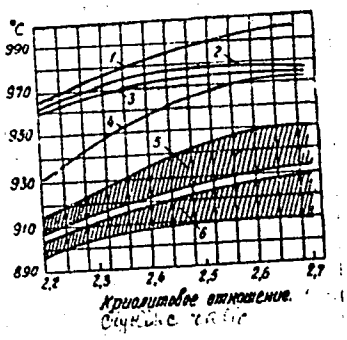

Figure 1

Temperature of beginning crystallization for pure NaF+ $+AlF_3$ melts (1) and melts with addition of 5% MgF_2 (2), 7.5% MgF_2 (3), 7.1% pure MgO (4), 5.8% metallurgical magnesite (5), and 7.23% caustic magnesite (6).

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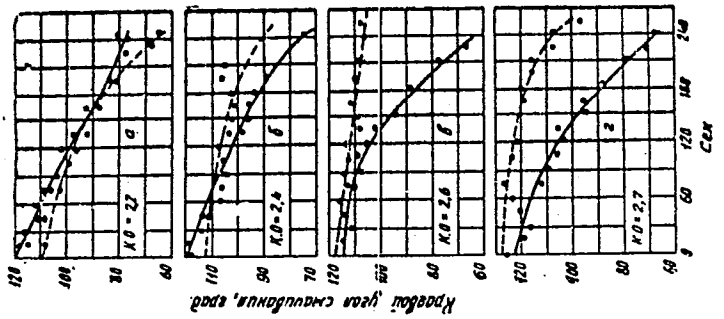

Figure 3

The effect of admixtures of 5% MgO (continuous lines) and 5% MgF_2 (dotted lines) on wetting contact angles of cryolite melts depending on time and the cryolitic ratio.

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The Effect of Magnesium Oxide on the Properties of Electrolyte in Aluminum Cells

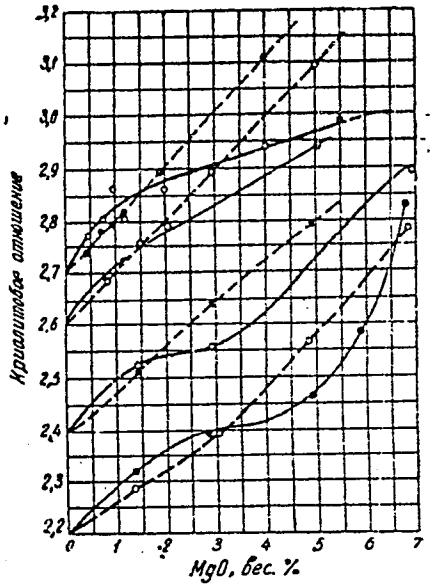

Figure 4

The effect of MgO on changes in the cryolitic ratio, determined by titration (continuous lines) and calculation (dotted lines) at initial cryolitic ratios of 2.2; 2.4; 2.6 and 2.7.

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A006/A001

The Effect of Magnesium Oxide on the Properties of Electrolyte in Aluminum Cells

There are 1 table and 4 figures.

ASSOCIATIONS: Krasnoyarskiy institut tsvetnykh metallov (Krasnoyarsk Institute of Non-Ferrous Metals); Kafedra metallurgii legkikh metallov (Department of Metallurgy of Light Metals)

SUBMITTED: December 17, 1959

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S/149/61/000/002/002/017
A006/A001

AUTHOR: Belyayev, A.I.

TITLE: Investigations of Molten Metals With the Aid of Gamma-Radiations

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, 1961, No. 2, pp. 39 - 42

TEXT: In a previous article published by the author in "Tsvetnaya metallurgiya, 1960, No. 6" he had investigated molten salts with the aid of gamma radiation, obtained from the radioactive Co^{60} isotope. In the present study, gamma radiation was employed to investigate some molten metals and binary metallic systems. By measuring the number of pulses per minute (n) the author determined the attenuation (absorbtion) of gamma radiations during their passage through a layer of molten metal. The same devices and methods were used as for the investigation of molten salts, with the only difference that instead of platinum containers, corundum crucibles number four were employed. The following technically pure metals were studied: magnesium, aluminum, copper, zinc, tin and lead. The total content of impurities in the metals did not exceed one tenth of a percent. Results obtained of measuring the pulse number (n) are given in a table. The binary molten

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Investigations of Molten Metals With the Aid of Gamma-Radiations

metal systems Al-Cu, Al-Zn, Al-Sn and Al-Mg were studied. Results of measuring the pulses are given in a series of graphs (Fig. 2) which show also changes in the electronic density (de_t) and the density of the alloys (d_t) at liquidus temperature and the liquidus of the system. As a result of the investigations performed it was found that the degree of absorbtion of gamma-radiations during their passage through a layer of molten metal increased in principle with a higher atomic number (z) and metal density. There is however an exception in the case of copper and tin. In spite of the fact that the atomic number of copper (29) is less than that of zinc (30), the number of pulses in the case of molten copper is much lower than that of molten zinc. The same anomaly was observed between the absorbtion of gamma radiation by zinc and tin. This is apparently due to the fact that the gamma rays encounter, on their way through molten copper, a greater number of electrons than in molten zinc; and in tin a relatively lesser number of electrons than in molten zinc. Therefore the number of pulses for molten metals and salts should be more correctly compared to the volumetric electronic density (de), i.e. to the number of electrons per 1 cm^3 of the atomic volume of the metal $de = \frac{z}{A/d} = \frac{z}{v}$, where A is the atomic weight of the metal; d is the density

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Investigations of Molten Metals With the Aid of Gamma-Radiations'

g/cm^3; v is the atomic volume, cm^3. A table shows the calculated volumetric electronic density for solid and molten metals. In Figure 1 the number of pulses is shown as a function of volumetric electronic density. In molten binary metal systems the degree of absorbtion of gamma radiation increases in principle (the number of pulses decreases) at a higher content of components with a higher value of the atomic number and greater density. A better agreement is obtained between changes in the number of pulses and the volumetric electronic density.

Table: The number of pulses, density and volumetric electronic density of molten metals

Металл Metal	t, °C	n, имп/мин pulse/min	z	d, г/см^3 g/cm^3		de, эл/см^3 el/cm^3	
				твердый solid	расплавленный molten	твердый solid	расплавленный molten
Mg	700	484	12	1,74	1,582	0,857	0,77
Al	700	458	13	2,70	2,373	1,30	1,14
Cu	1150	296	29	8,90	8,349	4,20	3,82
Zn	450	338	30	7,14	6,920	3,27	3,16
Sn	250	346	50	7,30	6,982	3,08	3,00
Pb	350	252	82	11,34	10,658	4,48	4,23

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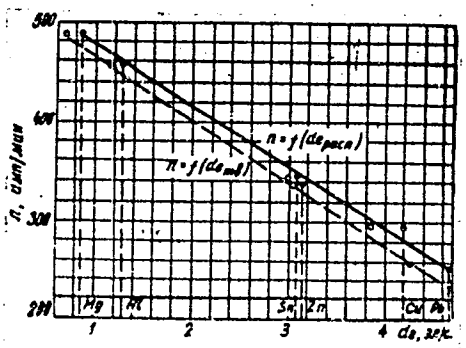
Investigations of Molten Metals With the Aid of Gamma-Radiations

Figure 1:

The effect of volumetric electronic density on the number of pulses (n) for solid and molten metals



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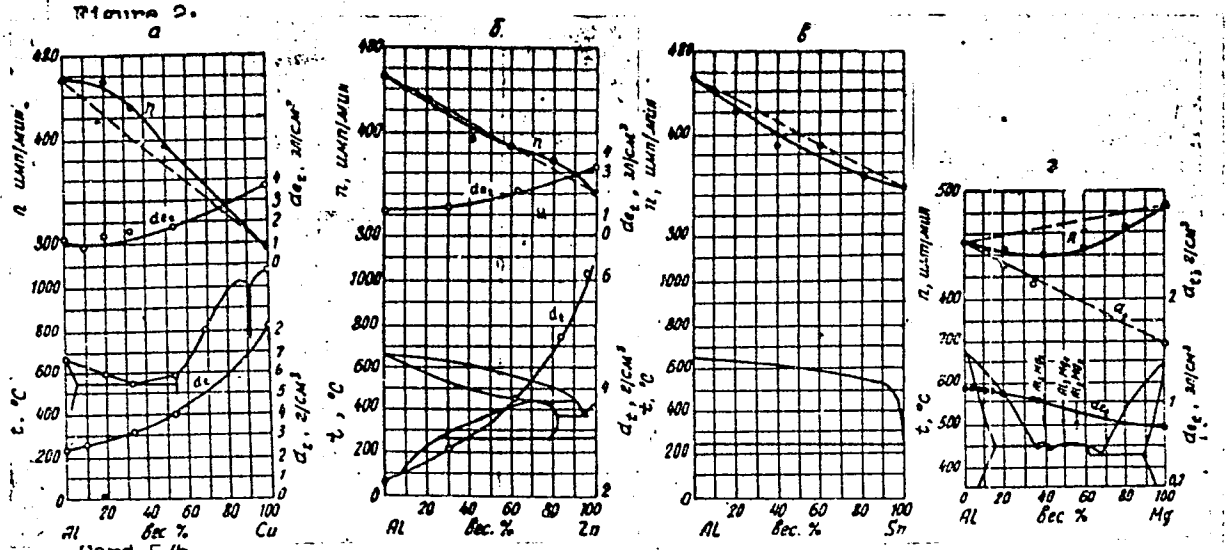
Investigations of Molten Metals With the Aid of Gamma-Radiations

Figure 2.



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Investigations of Molten Metals With the Aid of Gamma-Radiations

Figure 2: Comparison of the number of pulses (n) volumetric electronic density (de_t) and density (d_t) of molten systems Al-Cu (a), Al-Zn (b), Al-Sn (c), Al-Mg (d).

There are 1 table, 2 figures and 1 Soviet reference.

ASSOCIATIONS: Krasnoyarskiy institut tsvetnykh metallov (Krasnoyarsk Institute of Non-Ferrous Metals), Kafedra metallurgii legkikh metallov (Department of Metallurgy of Light Metals)

SUBMITTED: June 10, 1960

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S/149/61/000/002/016/017
A006/A001

AUTHORS: Belyayev, A.I., Zhemchuzhina, Ye.A., Firsanova, L.A.

TITLE: The All-Union Conference on Physical Chemistry of Molten Salts and Slags

PERIODICAL: Izvestiya vysshikh uchebnykh zavedeniy, Tsvetnaya metallurgiya, 1961, No. 2, pp. 162 - 165

TEXT: The All-Union Conference on physical chemistry of molten salts and slags was convened from November 22 - 25, 1960 in Sverdlovsk at the Institut elektrokhimii Ural'skogo filiala AN SSSR (Institute of Electrochemistry of the Ural Branch AS USSR). The Conference heard the following reports: Academician A.N. Frunkin's introductory report on the actual development of problems relating to the physical chemistry of molten electrolytes; Yu.K. Delimarskiy, Kiyev, on "Kinetics of Electrode Processes in Molten Salts"; N.K. Voskresenskaya, Moscow, on the present state of investigating thermodynamical properties of molten salts; Yu.V. Baymakov, Leningrad, on "Molten Salt - Metal Equilibrium". A number of reports dealt with results from investigating physico-chemical properties of salt systems, including papers delivered by: M.V. Kamenetskiy, Leningrad, on "Ternary

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The All-Union Conference on Physical Chemistry of Molten Salts and Slags

Systems of Barium, Potassium, Titanium Chlorides and of Barium, Sodium and Titanium"; V.G. Selivanov, Dnepropetrovsk, on results of investigating the physico-chemical properties of molten fluoro-borate oxides (Na_2BF_4 - NaF - B_2O_3) and fluoro-titanate-oxide (Na_2TiF_6 - NaF - TiO_2) systems; M.M. Vetyukov, Leningrad, on the properties and structure of melts of the sodium fluoride - aluminum fluoride system; L.A. Firsanova, Moscow, on the physico-chemical properties of cryolitic melts and of aluminum bath electrolytes containing barium chloride; Kh.L. Strel'tsa, Leningrad, on results of investigations into physico-chemical properties of melts of systems corresponding to the electrolytic composition of magnesium baths and containing $CaCl_2$ and $BaCl_2$. A.I. Belyayev, Moscow, on results of investigating molten salts with the aid of radio-active gamma radiation; I.D. Sokolova, Moscow, on "Surface Tension of Molten Salts"; R.V. Chernov, Kiyev, on investigating specific electric conductivity of $TiCl_3$-MeCl melts; B.F. Markov, Kiyev, on electro-conductivity of binary salt melts in connection with phase diagrams; G.V. Vorobyev, Sverdlovsk, on results of measuring electric conductivity of systems of molten alkali metal carbonates. A number of reports dealt with results of investigating molten salt-metal systems; N.F. Bukun, Berezniki, on

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results of investigating magnesium dissolution in molten chlorides; A.P. Palkin, Voronezh, on peculiarities in the reaction of salts with metals in mutual systems of displacement in molten state; S.A. Zaretskiy and V.B. Busse-Machukas, Moscow, on equilibria of $2KCl + Ca \rightleftarrows 2K + CaCl_2$ and $Na + KCl \rightleftarrows NaCl + K$; Ye.A. Zhemchuzhina, Moscow, on "The Effect of Metallic Admixtures in Aluminum on Interphase Tension and its Losses in Cryolitic-Alumina Melts"; The electrochemical extraction of zirconium from melts on potassium fluorozirconate base (K_2ZrF_6) and alkali metal chlorides was treated in the following reports: A.I. Yevstyukhin, Moscow, on positive results of electrolysis in closed cells with neutral atmosphere; M.V. Smirnov, Sverdlovsk, on equilibrium potentials of zirconium in chloride and mixed fluoro-chloride electrolytes; The following papers were concentrated on physical chemistry of molten slags: V.L. Kheyfets, Leningrad, on "The Conditions of Metals Dissolved in Non-Ferrous Metallurgical Slags"; D.M. Chizhikov, Moscow, on some physico-chemical properties of silicate melts, containing heavy non-ferrous metals; I.N. Zakhatov, Sverdlovsk, on results of investigating the solubility of chromium oxide in molten slags; A.A. Velikanov, Kiyev, on "Electrochemical Investigation of Molten Sulfides of Heavy Metals; The Conference recommended to concentrate

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The All-Union Conference on Physical Chemistry of Molten Salts and Slags

scientific research on the molecular-ionic structure of molten salts and slags; thermodynamics of salt and slag melts; the structure of molten electrolytes; electrochemical investigation of melts; surface phenomena in electrolytes and other fields. It was suggested to convene the next Conference in 1962 in Kiyev.

BELYAYEV, A.I. (Moskva); FIRSANOVA, L.A. (Moskva)

Effect of barium chloride on the physicochemical properties of cryolite-alumina melts. Izv. AN SSSR. Otd. tekh. nauk. Met. i topl. no.4:3-11 Jl-Ag '61. (MIRA 14:8)
(Aluminum--Electrometallurgy)
(Barium chloride)

BELYAYEV, A.I. (Moskva); ZHEMCHUZHINA, Ye.A. (Moskva)

Effect of metallic admixtures in aluminum on the interphase tension and metal losses in cryolite-alumina melts. Izv.AN SSSR.Otd.tekh. nauk.Met.i topl. no.5:11-18 S-O '61. (MIRA 14:10)

1. Krasnoyarskiy institut tsvetnykh metallov.
(Aluminum--Electrometallurgy)

BELYAYEV, A.I.

Seventy-five years of electrolytic production of aluminum.
Izv. vys. ucheb. zav.; tsvet. met. 4 no. 1:172-177 '61.
(MIRA 14:2)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Aluminum--Electrometallurgy)

BELYAYEV, A.I.

Conference on the chemistry and technology of alumina. Izv. vys. ucheb. zav.; tsvet. met. 4 no. 1:182-184 '61. (MIRA 14:2)
(Alumina--Congresses)

BELYAYEV, A.I.

Investigating molten metals by means of gamma rays. Izv. vys. ucheb. zav.; tsvet. met. 4 no.2:39-42 '61. (MIRA 14:6)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.

(Liquid metals)
(Gamma rays—Industrial applications)

BALAZH, E.; BELYAYEV, A.I.

New methods of investigating aluminum losses in cryolite-alumina melts. Izv. vys. ucheb. zav.; tsvet. met. 4 no.2:64-70 '61. (MIRA 14:6)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.

(Aluminum--Electrometallurgy)

BELYAYEV, A.I.; ZHEMCHUZHINA, Ye, A.; FIRSANOVA, L.A.

All-Union Conference on the Physical Chemistry of Fused Salts and Slags. Izv. vys. ucheb. zav.; tsvet. met. 4 no.2:162-165 '61. (MIRA 14:6)

(Chemistry, Physical and theoretical—Congresses)

BALAZH, E.; BELYAYEV, A.I.

Investigating by a new method current efficiency in the production of aluminum by electrolysis of cryolite-alumina melts. Izv. vys. ucheb. zav.; tsvet. met. 4 no.3:67-74 '61. (MIRA 15:1)

1 Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.

(Aluminum--Electrometallurgy)

BELYAYEV, A.I.

Beketov and modern metallurgy. Izv. vys. ucheb. zav.; tsvet. met. 4 no.3:153-154 '61. (MIRA 15:1)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Beketov, Nikolai Nikolaevich, 1826-1911)
(Metallurgy)

BELYAYEV, A.I.

Investigating by means of gamma rays fused salts containing dissolved metals. Izv. vys. ucheb. zav.; tsvet. met. 4 no.4: 40-44 '61. (MIRA 14:8)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Salts—Analysis) (Gamma rays)

BOCHVAR, A.A.; BELYAYEV, A.I.; PAVLOV, I.M.; PLAKSIN, I.N.; CHIZHIKOV, D.M.; PERLIN, I.L.

Petr Stepanovich Istomin; on his 80th birthday. Izv. vys. ucheb. zav.; tsvet. met. 4 no.4:161-163 '61. (MIRA 14:8)
(Istomin, Petr Stepanovich, 1881-)

ZHEMCHUZHINA, Ye.A.; BELYAYEV, A.I.

Effect of direct current superposition on the wetting of graphite by alumina-cryolite melts. Izv. vys. ucheb. zav.; tsvet. met. 4 no.5:123-132 '61. (MIRA 14:10)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Aluminum--Electrometallurgy)

FIRSANOVA, L.A.; BELYAYEV, A.I.

Effect of salt additions on aluminum solubility in cryolite-alumina melts. Izv. vys. ucheb. zav.; tsvet. met. 4 no.6:72-78 '61. (MIRA 14:12)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Aluminum--Metallurgy)

BELYAYEV, A.I.; FIRSANOVA, L.A.; VOL'FSON, G.Ye.; LAZAREV, G.I.

Effect of cathodic current density and the cryolite relation of electrolytes on the current efficiency in aluminum production. Izv. vys. ucheb. zav.; tsvet. met. 4 no.5:117-122 '61. (MIRA 14:10)

1. Krasnoyarskiy institut tsvetnykh metallov i Volkhovskiy alyuminiyevyy zavod.
(Aluminum--Electrometallurgy)

22799

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E073/E535

18.3100A also 1087

AUTHORS: Belyayev, A.I., Firsanova, L. A., Vol'fson, G.Ye. and Katon, Ya. Sh.

TITLE: On the Problem of Interaction of Barium Chloride with Cryolite Melts and its Influence on the Technology of Electrolytic Refining of Aluminium

PERIODICAL: Tsvetnyye metally, 1961, No.5, pp.43-45

TEXT: In electrolytic refining of aluminium by means of the three-layer method, an electrolyte is used consisting of barium chloride, cryolite, aluminium fluoride and sodium chloride. Chemical analyses of electrolytes reveal the presence in the electrolytes of barium fluoride in quantities reaching 17 to 18%. This indicates interaction in such melts of barium chloride with the fluorides, for instance in accordance with the reaction:

$$3BaCl_2 + 2AlF_3 \rightarrow 3BaF_2 + 2AlCl_3 \quad (1)$$

The results are given of analyses of the electrolytes from baths for electrolytic refining of Al with various cryolite ratios, Table 1. (K.o. - cryolite ratio; composition of the electrolyte,

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wt.%). It can be seen that with decreasing cryolite ratios, from 1.94 to 1.33 (i.e. with increasing AlF_3 content), the content of BaF_2 increases from 1.89% to 17.31%. According to the reaction, Eq.(1), in addition to BaF_2, volatile $AlCl_3$ forms, which leads to a partial loss of Cl. For the purpose of verifying the possibility of the reaction expressed by Eq.(1), synthetic mixtures of salts were produced with cryolite ratios between 1 and 3 containing 3 to 60 wt.% $BaCl_2$. This mixture was maintained in the molten state for 1 hour at 1000°C and then rapidly cooled and analysed chemically for the contents of Na, Al, Ba and Cl. From the analytically determined Ba and Cl contents, the respective content of $BaCl_2$ was calculated and these values were compared. A plot is made of the analytically determined $BaCl_2$ content (%, based on the % of Cl_2 in the melt) as a function of the $BaCl_2$ content in the charge for cryolite ratios (K.c.) of 2.8 to 1.0 (the uppermost line applies to the initial $BaCl_2$ content in the charge). The results show that the reaction expressed by Eq.(1) does indeed take place and leads to an accumulation of BaF_2 in the electrolyte. This is brought about by an increase in the AlF_3 content

of the melt, i.e. by a decrease in the cryolite ratio. The following conclusions are arrived at:
1. Considerable interaction was observed in melts with cryolite ratios below 2, whereby as a result of this interaction BaF_2 forms which has an unfavourable influence on the properties of the melt.
2. To improve the operation of industrial baths in electrolytic refining of Al, the cryolite ratio must not drop below 1.7.
3. It is necessary to develop a rapid method of analysis of the electrolyte which is applicable to electrolytic refining of Al for the purpose of systematic checking of the composition and maintaining an optimum cryolite ratio. There are 1 figure and 2 tables.

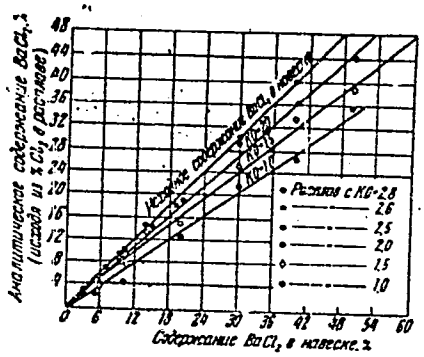
ASSOCIATIONS: Institut tsvetnykh metallov imeni M. I. Kalinina (Institute of Nonferrous Metals imeni M.I.Kalinin) (Belyayev and Firsanova).
Volkhovskiy alyuminiyevyy zavod (Volkhov Aluminium Works) (Vol'fson and Katon)

22799
S/136/61/000/005/002/008
E073/E535

Table 1

К. о.	Состав электролита, % вес.				
	$BaCl_2$	CaF_2	NaF	AlF_3	Al_2O_3
1,94	58,52	1,89	16,61	17,12	—
1,70	55,85	4,58	15,26	17,95	—
1,53	47,2	13,55	14,22	18,63	4,31
1,33	42,3	17,31	13,0	19,55	3,8

Figure



Влияние криолитового отношения расплава на содержание хлорида бария, рассчитанное из аналитического определения хлора

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S/019/61/000/005/054/078
A153/A127

AUTHORS: Belyayev, A.I., and Firsanova, L.A.

TITLE: A method for refining aluminum from admixtures by distillation means

PERIODICAL: Byulleten' izobreteniy, no. 5, 1961, 58

TEXT: Class 40c, 6_{04}. No. 136567 (678823/23 of September 10, 1960). A method for refining aluminum from admixtures by distilling same under a vacuum, differing in that, with the object of simplifying the process of refining and reducing its cost, the initial aluminum in molten state is distilled under a vacuum with the aid of vaporous sodium chloride.

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S/828/62/000/000/005/017
E039/E420

AUTHORS: Kozhemyakin, V.A., Filatova, N.A., Belyayev, A.I.

TITLE: The separation of zirconium and hafnium tetrachlorides

SOURCE: Razdeleniye blizkikh po svoystvam redkikh metallov. Mezhvuz. konfer. po metodam razdel. blizkikh po svoyst. red. metallov. Moscow, Metallurgizdat, 1962, 63-70

TEXT: The change in isobaric potential of reactions in the separation of Zr and Hf by selective reduction of $ZrCl_4$ is determined. As a result of these thermodynamic calculations the feasibility of such a method of separation is demonstrated. The reduction is accomplished in an evacuated ampule by means of powdered Zr or Al. The HfO_2 in the initial chloride is 0.8 to 1.3%; temperature of reduction 350 to 450°C for 4 to 13 hours; initial residual pressure 1×10^{-2} mm Hg and weight chloride 7 to 14 g. Graphs are presented showing the dependence of $x_б$, the HfO_2 content in the unreduced $ZrCl_4$, and $x_б$, the HfO_2 content in the purified $ZrCl_4$. Both curves are near logarithmic. For a value of B = 90% $x_б$ is ~8% and $x_б$ ~0.3%. Plotting log B against $1/x_б$ and $1/x_б$ gives two straight lines, with

Card 1/2

The separation of ...

ranges of 0.06 to 0.2% and 4 to 25% respectively, which can be represented by the following equations

$$\log B = 2.015 - \frac{0.50}{x_6}$$

$$\log B = 1.958 - \frac{0.0053}{x_6}$$

The experiments show that separation coefficients of greater than 100 can be obtained under optimum conditions. There are 5 figures and 1 table.

Card 2/2

FIRSANOVA, L.A.; BELYAYEV, A.I.

Effect of salt admixtures on the solubility and the speed of alumina solution in cryolite melts. Izv.vys.ucheb.zav.; tsvet. met. 5 no.1:77-81 '62. (MIRA 15:2)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Alumina) (Solubility)

BELYAYEV, A.I.

Conference on Surface Phenomena in Metallurgical Processes. Izv. vys.ucheb.zav.; tsvet.met. 5 no.1:161-162 '62. (MIRA 15:2)
(Surface chemistry--Congresses) (Metallurgy--Congresses)

FIRSANOVA, L.A.; BELYAYEV, A.I.

Loss of aluminum in cryolite melts. Izv. vys. ucheb. zav.; tsvet. met. 5 no.2:88-94 '62. (MIRA 15:3)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.

(Aluminum--Electrometallurgy)

FIRSANOVA, L.A.; BELYAYEV, A.I.

Effect of crucible material and design of the cell on aluminum losses in cryolite melts. Izv.vys.ucheb.zav.; tsvet.met. 5 no.3:53-58 '62. (MIRA 15:11)

1. Krasnoyarskiy institut tsvetnykh metallov, kafedra metallurgii legkikh metallov.
(Aluminum--Electrometallurgy)

SPUTNOVA, I.A.; BELYAYEV, A.I.

Low-temperature caking of nephelines with caustic alkalis. Izv. vys. ucheb. zav.; tsvet. met. 5 no.5:93-99 '62. (MIRA 15:10)

1. Moskovskiy institut stali, kafedra chistykh metallov i poluprovodnikovykh materialov.
(Nepheline) (Hydrometallurgy)

BELYAYEV, A.I.

Rumanina-Soviet scientific conference on the physical chemistry of fused salts. Izv. vyss. ucheb. zav.; tsvet. met. 5 no.5:167-168 '62. (MIRA 15:10)

(Fused salts—Congresses)

SOKOLOV, O.K.; BELYAYEV, A.I.

Evaluation of the probability of the formation of compounds in binary systems consisting of salts and oxides. Zhur.neorg.khim. 7 no.6:1320-1327 Je '62. (MIRA 15:6)

1. Krasnoyarskiy institut tsvetnykh metallov imeni M.I.Kalinina, kafedra metallurgii legkikh metallov.
(Systems (Chemistry)) (Complex compounds)

SOKOLOV, O.K.; BELYAYEV, A.I.

Applying crystal chemistry concepts to the interpretation of exchange decomposition reactions in melts. Zhur.neorg.khim. 7 no.6:1328-1335 Je '62. (MIRA 15:6)

1. Krasnoyarskiy institut tsvetnykh metallov imeni M.I.Kalinina, kafedra metallurgii legkikh metallov.
(Fused salts)

BELEAEV, A.I. [Belyayev, A.I.]

Salts containing dissolved metals melted with gamma rays. Analele metalurgie 16 no.1:46-50 Ja-Mr '62.

FIRSANOVA, L.A.; BELEAEV, A.I. [Belyayev, A.I.]

Aluminum losses in cryolite fusions. Analele metalurgie 16 no.4:81-87 O-D '62.

BELYAEV, A.I. [Belyayev, A.I.]; ZUCA, Stefania

A Rumanian-Soviet scientific conference on the theme "Physical Chemistry of Melted Electrolytes." Analele chimie 17 no.4: 177-181 O-D '62.

1. Membru corespondent al Academiei de Stiinte a U.R.S.S. (for Belyayev).

BELYAYEV, A. I.

BALAZS, Endre, dr., a muszaki tudomanyok kandidatusa; BELJAJEV, A.I. [Belyaev, A.I.] egyetemi tanar, a muszaki tudomanyok doktora

On the correlation between aluminum losses and current efficiency on melted, cryolite-aluminum oxide electrolytes. Koh lap 95 nc.9:403-405 S '62.

BALAZS, Endre, dr., a muszaki tudomanyok kandidatusa; BELJAJEV, A.I. [Belyayev, A.I.], a muszaki tudomanyok doktora, egyetemi tanar

On the optimum aluminumoxide concentration of the electrolyte of aluminum-electrolysis baths. Koh lap 95 no.10:443-447 O '62.

KITLER, Igor' Nikolayevich; LAYNER, Yuriy Abramovich; MALYSHEV, M.F., kand. tekhn. nauk, retsenzent; BELYAYEV, A.I., red.; EL'KIND, L.M., red.izd-va; KARASEV, A.I., tekhn. red.

[Nepheline rocks are complex raw materials for the aluminum industry]Nefeliny - kompleksnoe syr'e aliuminievoi promyshlennosti. Moskva, Metallurgizdat, 1962. 236 p. (MIRA 15:8)

1. Chlen-korrespondent Akademii nauk SSSR (for Belyayev).
(Nepheline)

BELYAYEV, Anatoliy Ivanovich; EL'KIND, L.M., red. izd-va; ATTOPOVICH, M.K., tekhn. red.

[Metallurgy of light metals; a general course] Metallurgiia legkikh metallov; obshchii kurs. Izd.5. Moskva, Metallurgizdat, 1962. 442 p. (MIRA 15:7)

(Light metals—Metallurgy)

BELYAYEV, A.I., otv. red.; EL'KIND, L.M., red.izd-va; MIKHAYLOV, V.V., tekhn. red.

[Physical chemistry of fused salts and slags; transactions] Fizicheskaia khimiia rasplavlennykh solei i shlakov; trudy. Moskva, Metallurgizdat, 1962. 479 p. (MIRA 15:7)

1. Vsesoyuznoye soveshchaniye po fizicheskoy khimii rasplavlennykh soley i shlakov, Sverdlovsk, 1960. 2. Institut tsvetnykh metallov im. M.I.Kalinina, chlen-korrespondent Akademii nauk SSSR (for Belyayev).

(Fused salts)

BELYAYEV, A.I., red.; EL'KIND, L.M., red.izd-va; KARASEV, A.I., tekhn. red.

[Transactions of the Interuniversity Scientific and Technical Conference on Surface Phenomena in Metallurgical Processes] Sbornik trudov Mezhvuzovskoy nauchno-tekhnicheskoy konferentsii po poverkhnostnym iavleniiam v metallurgicheskikh protsessakh, Moscow, 1961. Moskva, Metallurgizdat, 1963. 266 p. (MIRA 16:8)

1. Mezhvuzovskaya nauchno-tekhnicheskaya konferentsiya po poverkhnostnym iavleniyam v metallurgicheskikh protsessakh, Moscow, 1961. 2. Institut tsvetnykh metallov im. M.I.Kalinina (for Belyayev).
(Surface chemistry) (Metallurgy)

BELYAYEV, A.I., red.

[Surface phenomena in metallurgical processes; collection of transactions] Poverkhnostnye iavleniia v metallurgicheskikh protsessakh; sbornik trudov. Moskva, Metallurgizdat, 1963. 266 p. (MIRA 18:8)

1. Mezhvuzovskaya nauchno-tekhnicheskaya konferentsiya "Poverkhnostnyye yavleniya v metallurgicheskikh protsessakh," Moscow, 1961. Krasnoyarskiy institut tsvetnykh metallov imeni M.I.Kalinina.

KRIVORUCHENKO, Vladimir Vladimirovich[deceased]; KOROBOV, Mikhail Aleksandrovich; BELYAYEV, A.I., retsenzent; KALUZHSKIY, N.A., inzh., retsenzent; SHENKOV, V.V., inzh., retsenzent; OL'KHOV, I.I., inzh., red.; EL'KIND, L.M., red. izd-va; ISLENT'YEVA, P.G., tekhn. red.

[Heat and power balance of aluminum and magnesium electrolyzers] Teplovye i energeticheskie balansy aliuminievykh i magnievykh elektrolizerov. Moskva, Metallurgizdat, 1963. 319 p. (MIRA 16:4)

1. Chlen-korrespondent Akademii nauk SSSR (for Belyayev). (Electrometallurgy) (Heat—Transmission)

BELYAYEV, A.I., otv. red.; BYKHOVSKIY, Yu.A., red.; VELIER, R.L., red. [deceased]; GREYVER, N.S., red.; KLUSHIN, D.N., red.; OL'KHOV, N.P., red.[deceased]; RUMYANTSEV, M.V., red.; SAZHIN, N.P., red.; STRIGIN, I.A., red.; TROITSKIY, A.V., red.; KAMAYEVA, O.M., red. izd-va; LUTSKAYA, G.A., red. izd-va; VAYNSHTEYN, Ye.B., tekhn. red.

[Principles of metallurgy in 4 volumes]Osnovy metallurgii v 4 tomakh. Red.kollegiia: IU.A.Bykhovskii i dr. Moskva, Metallurgizdat. Vol.3.[Light metals]Legkie metally. Otv.red.A.I. Beliaev i N.S.Greiver. 1963. 519 p. (MIRA 16:2)
(Light metals)

Magnetic properties of semiconductors. K. D. Tovstyuk.

This presentation consisted of the following papers:

Anisotropy of susceptibility of semiconductors. K. D. Tovstyuk, E. I. Slynko, I. M. Stakira, O. M. Boretz.

Magnetic and thermomagnetic properties of HgTe, PbTe, HgSe, PbSe. K. D. Tovstyuk, M. P. Gavaleshko, Ya. S. Budzhak, P. M. Starik, P. I. Voronyuk.

Magnetic susceptibility of CdTe and ZnTe. I. V. Potykevich, A. V. Savitskiy.

Magnetic properties of the system HgTe-CdTe. K. D. Tovstyuk, I. M. Rarenko, I. V. Potykevich.

Anisotropy of the thermal conductivity of CdSb. I. M. Pilat, L. I. Anatychyuk.

Electrical, magnetic, and optical properties of the system In_2Te_3-CdTe. I. V. Potykevich, A. I. Belyayev, S. V. Chepura.

Properties of crystals of CdSb doped with elements of groups IV and VI. S. M. Zubiev.

Some properties of solid solutions based on gallium phosphide.
V. V. Nezreskul, S. I. Radautsan, I. K. Takhtareva (10 minutes).

Some electrical, optical, and magnetic properties of the ternary semiconducting compound $CdIn_2Te_4$. I. V. Potykevich, O. I. Belyayev, S. V. Chepura (10 minutes).

Report presented at the 3rd National Conference on Semiconductor Compounds, Kishinev, 16-21 Sept 1963

BELYAYEV, A.I. (Moskva)

Aluminum distillation through subhalogenides. Izv. AN SSSR. Otd. tekh. nauk. Met. i gor. delo no.4:22-31 Jl-Ag '63. (MIRA 16:10)

L 18415-63 EWP(q)/EWT(m)/BDS AFFTC/ASD JD
ACCESSION NR: AP3005804 S/0136/63/000/008/0089/0091

55

AUTHORS: Belyayev, A. I.; Kostyukov, A. A.

TITLE: Meeting of workers of the aluminum industry to discuss the composition of electrolyte 27

SOURCE: Tsvetny*ye metally*, no. 8, 1963, 89-91

TOPIC TAGS: aluminum, aluminum industry, cryolite, magnesium fluoride, NaCl, MgCl, calcium fluoride, lithium salts

ABSTRACT: This article describes the meeting of industrial research institutions and aluminum concerns which summarized the work and investigations devoted to various electrolytes for aluminum vats and gave recommendations of their optimum compositions. The members recommended that, as a further technical progress in the production of aluminum, the cryolite ratio to the electrolytes of the aluminum vats must be retained within the limits of 2.6 to 2.8 with total additions to the electrolyte of 8 to 10%. The additions must consist of mixtures of magnesium fluoride with sodium chloride in quantities 27

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ACCESSION NR: AP3005804

of 3-4% MgF_2 and 2-4% NaCl or an equivalent mixture of 2-3% Mgcl with 1-2% MgF_2 together with a quantity of CaF_2 which is formed in the vat by natural means. The members recognized the addition of lithium salts to the electrolyte as being a necessary topic in future studies. Orig. art. has: no graphics

ASSOCIATION: none

SUBMITTED:	10May63	DATE ACQ:	06Sep63	ENCL:	00
SUB CODE:	ML, IE	NO REF SOV:	000	OTHER:	000

Card 2/2

ACCESSION NR: AT4001237 S/3031/63/000/035/0101/0107

AUTHORS: Belyayev, A. I.; Firsanova, L. A.; Vol'fson, G. Ye.; Lazarev, G. I.; Pal'chikov, A. I.

TITLE: Obtaining ultrapure aluminum by distillation through subfluoride in a pilot unit

SOURCE: Gosudarstvenny*y institut tsvetny*kh metallov. Sbornik nauchny*kh trudov. Moscow, no. 35, 1963, 101-107

TOPIC TAGS: ultrapure aluminum, ultrapure aluminum production, ultrahigh purity metal, ultrahigh purity metal production, ultrahigh purity aluminum, ultrahigh purity aluminum production

ABSTRACT: Apparatus for the production of ultrapure aluminum by distillation via the hypofluoride, developed at the Institut tsvetny*kh metallov im. M. I. Kalinina (Institute of Nonferrous Metals) by A. I. Belyayev and L. A. Firsanova (Trudy Mintsvetmetzoloto im. M. I. Kalinina, no. 33, 1960) is described briefly. In this method the purified aluminum is brought in contact with vapor-

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ACCESSION NR: AT4001237

ized aluminum fluoride at 1050° and residual pressure 10^{-1}--10^{-2} mm Hg. The produced aluminum hypofluoride is decomposed into pure aluminum and aluminum fluoride which is returned to the cycle. During the course of the trials of the aluminum distillation technology, conditions were found under which large aluminum ingots of specified shape can be produced in the condenser, with simultaneous production of the return condensate (Al + AlF_3 with small amount of disperse aluminum). Tests with the pilot plant have shown the possibility of producing by this method superpure aluminum (99.999%) in amounts up to 1 kg a day. The aluminum obtained in the pilot plant was found suitable for production of semiconductor rectifiers, since the siluminum produced from it has less than 0.0001% Fe, 0.0006% Mg, and 0.0001% Cu. Orig. art. has: 3 figures and 2 tables.

ASSOCIATION: Gosudarstvenny*y institut tsvetny*kh metallov (State Institute of Nonferrous Metals)

Card 2/2

TARARIN, S.V.; BELYAYEV, A.I.

Selection of additives for improving the composition of electrolytes for aluminum baths. Izv. vys. ucheb. zav.; tsvet. met. 6 no.3:96-99 '63. (MIRA 16:9)

1. Moskovskiy institut stali i splavov, kafedra proizvodstva chistykh metallov i poluprovodnikov materialov.
(Aluminum--Electrometallurgy)
(Electrolytes)

DEYTER, U.; BELYAYEV, A.I.

Obtaining pure magnesium by electrolytic refining. Izv. vys. ucheb. zav.; tsvet. met. 6 no.4:94-101 '63. (MIRA 16:8)

1. Moskovskiy institut stali i splavov, kafedra chistykh metallov i poluprovodnikovykh materialov.
(Magnesium--Electrometallurgy)

BELYAYEV, A.I.

Ways of technological progress in the metallurgy of light-weight metals. Vest. AN SSSR 33 no.6:46-52 Je '63. (MIRA 16:7)

1. Chlen-korrespondent AN SSSR.

(Metallurgy)

BELYAYEV, A.I.; KOSTYUKOV, A.A.

Conference of workers in the aluminum industry on the composition of electrolytes. TSvet. met. 36 no.8:89-91 Ag '63. (MIRA 16:9)
(Aluminum industry--Congresses) (Electrolytes--Analysis)

S/056/63/044/002/011/065
B102/B186

AUTHORS: Belyayev, A. I., Yeremenko, V. V.

TITLE: Temperature dependence of the optical-absorption band width for MnF_2 crystals

PERIODICAL: Zhurnal eksperimental'noy i teoreticheskoy fiziki, v. 44, no. 2, 1963, 469-471

TEXT: Shape and intensity of the π and σ components of the C-band were determined at 300, ~180, 90, 77, 65, 55, and 20°K; the measurements were made with polarized light using the high-dispersion spectrographs ДФС-8 (DFS-8) (6 Å/mm) and ДФС-3 (DFS-3) (4 Å/mm). The absorption intensity was determined by the usual photometric method. The absorption coefficients were plotted versus λ for different temperatures and for both $\vec{E} \parallel \vec{c}$ (π) and $\vec{E} \perp \vec{c}$ (σ). From these curves the half-width δ of the C and D bands was calculated. Below the Néel point (68°K), δ increases with T exponentially; at this point the curves show a break and continue linearly, for the π-component almost independently of T, and for the

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Temperature dependence of ...

σ-component weakly increasing with T. Since it cannot be assumed that at T_N the phonon spectrum or the electron-phonon interaction changes abruptly, the absorption band width and shape of antiferromagnetic crystals is assumed as determined by interactions with excitations of the type of spin waves. There are 3 figures.

ASSOCIATION: Fiziko-tekhnicheskiy institut nizkikh temperatur Akademii nauk USSR (Physicotechnical Institute of Low Temperatures of the Academy of Sciences UkrSSR)

SUBMITTED: August 13, 1962

Card 2/2

BELYAYEV, A.I. (Moskva)

Chemical transport reactions and their use to obtain pure metals and semiconductor materials. Izv. AN SSSR. Met. i gor. delo no.1:3-14 Ja-F '64. (MIRA 17:4)

ACCESSION NR: AP4017566 S/0149/64/000/001/0108/0111

AUTHORS: Pinchuk, Ya. M.; Belyayev, A. I.

TITLE: The mechanism of aluminum vacuum distillation process with the aid of chlorides

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 1, 1964, 108-111

TOPIC TAGS: metal purification, aluminum, aluminum chloride, aluminum subchloride, sodium chloride, magnesium chloride, distillation, vacuum distillation, sublimation

ABSTRACT: Metals of high purity can be obtained by sublimation at high temperature in the presence of chlorides, but the mechanism of the process was not properly understood. The authors supplied experimental proof that within a temperature range of 1173-1373C the reaction of vaporized aluminum with sodium chloride or magnesium chloride will yield aluminum subchloride (AlCl) rather than aluminum chloride ($AlCl_3$), which is supported also by thermodynamic calculations. The experiments were conducted in a vacuum installation of heat resistant steel (see Fig. 1 on the Enclosure) inside which was placed a carborundum tube containing the boats with aluminum and sodium chloride. The section containing the metal was provided

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ACCESSION NR: AP4017566

with a silit heater and the zone containing the salt with a standard electric heater. One end of the carborundum tube was provided with an effective cooling device and a vapor trap. Weighed aliquots of Al and of NaCl or $MgCl_2$ were placed in the tube, the temperature was brought, to 300C, and the vacuum was lowered to 1×10^{-4} mm Hg. The silit heater was switched on and the temperature kept at the desired level by means of thermoregulators. After this the heater over the salt zone was switched on, and the sublimation was allowed to proceed for one hour. The oven (with the vacuum pumps still operating) was allowed to cool for 4 hours. The combustion boats with the aluminum and the sodium chloride or magnesium chloride, and the condensed material were weighed. It was found that for each gram of sublimed aluminum there were 2.17-2.19 grams of vaporized NaCl, or 1.75-1.80 grams of $MgCl_2$. This matches closely the respective theoretical values of 2.17 and 1.76 gms for aluminum subchloride (AlCl). Orig. art. has: 3 tables, 1 chart, 5 formulas, and 1 equation.

ASSOCIATION: Moskovskiy institut stali i splavov. Kafedra proizvodstva chisty*kh metallov i poluprovodnikovy*kh materialov (Moscow Institute of Steel and Alloys, Department of Production of Pure Metals and Semiconductor Materials)

Card 2/2

BELYAYEV, A.I.

Pavel Pavlovich Fedotʹev on the 100th anniversary of his birth. Izv. AN SSSR Met. i gor. deloo no.3 [illegible] (MIRA 17:3)

1. Chlen-korrespondent AN SSSR.

VAKHOBOV, A.V. (Moskva); BELYAYEV, A.I. (Moskva)

Effect of various saline components on the electric conductivity of the electrolyte in an aluminum electrolytic cell. Izv. AN SSSR. Met. i gor. delo no.4:80-86 Jl-Ag '64. (MIRA 17:9)

VOL'BERG, A.A.; SUKHANOV, Ye.L.; BELYAYEV, A.I.

Structure and thermophysical properties of the crust on the lining of electrolytic aluminum cells. Izv. AN SSSR. Met. i gor. delo no.5:45-56 S-O '64. (MIRA 18:1)

L 20994-65 EPR/EWT(m)/EWP(b)/EWP(t)/ Ps-4 IJP(c) JD

ACCESSION NR: AP5000140 S/0149/64/000/005/0071/0076

AUTHOR: Pinchuk, Ya. M.; Belyayev, A. I.

TITLE: Investigation of the kinetics of aluminum distillation in a vacuum by means of halides

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 5, 1964, 71-76

TOPIC TAGS: aluminum distillation, aluminum halide, magnesium halide, vacuum distillation, sodium halide, halide distillation

ABSTRACT: The effect of various factors on the kinetics of aluminum distillation was studied by means of admixture with the halides of other metals and of aluminum itself. The quantitative relationship between the output of the distillation process and the changes in temperature and pressure was derived (see Fig. 1 of the Enclosure). The data obtained made it possible to characterize approximately the yield of aluminum per unit of surface and time. The experimentally established equilibrium temperature for the four reactions between liquid Al and halide discussed in the article indicated that with a residual pressure of $1 \cdot 10^{-3}$ mm Hg, the temperature at the start of the distillation process

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ACCESSION NR: AP5000140

was about 200C lower than at atmospheric pressure. The coincidence of the temperature at the start of decomposition of the subchloride and subfluoride (660C) at the indicated residual pressure indicated that the process of aluminum distillation was limited by the transition of aluminum from the liquid state to the solid. The practical importance of a deeper vacuum for increasing the output of the distillation was demonstrated. A quantitative estimate of the yield from the distillation of aluminum was derived with the use of various halides and the equilibrium constants for the reactions were determined for the most important temperatures. Orig. art. has: 17 formulas, 2 figures and 1 table.

ASSOCIATION: Kafedra proizvodstva chisty*kh metallov i poluprovodnikovy*kh materialov, Moskovskiy institut stali i splavov (Department of the Production of Pure Metals and Semiconductor Materials, Moscow Institute of Steel and Alloys)

SUBMITTED: 27Sep63 ENCL: 01 SUB CODE: MM

NO REF SOV: 004 OTHER: 000

Card 2/3

L 20994-65

ACCESSION NR: AP5000140

ENCLOSURE: 01

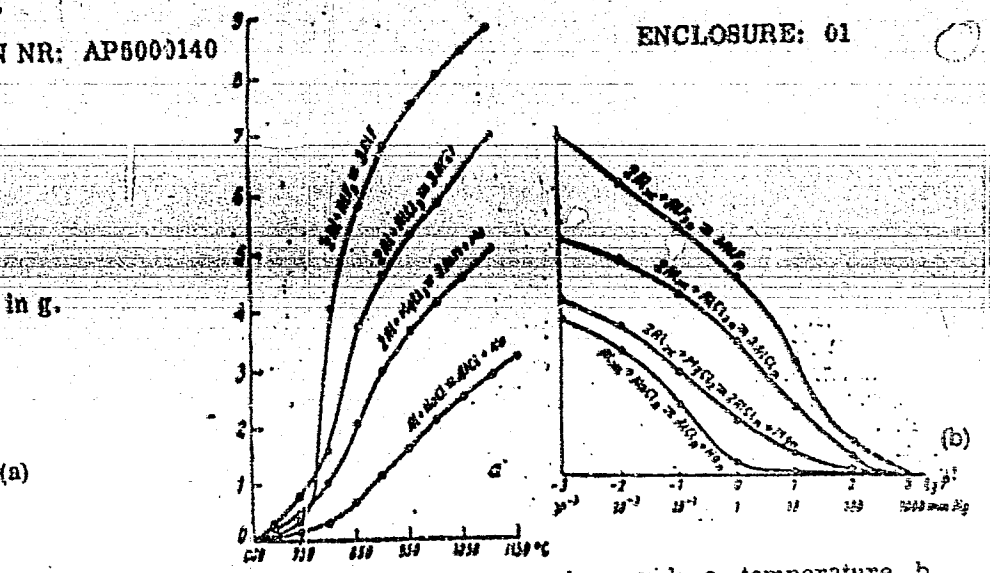

Fig. 1. Relationship between the yield of distilled aluminum and: a. temperature, b. residual pressure at 1000C.

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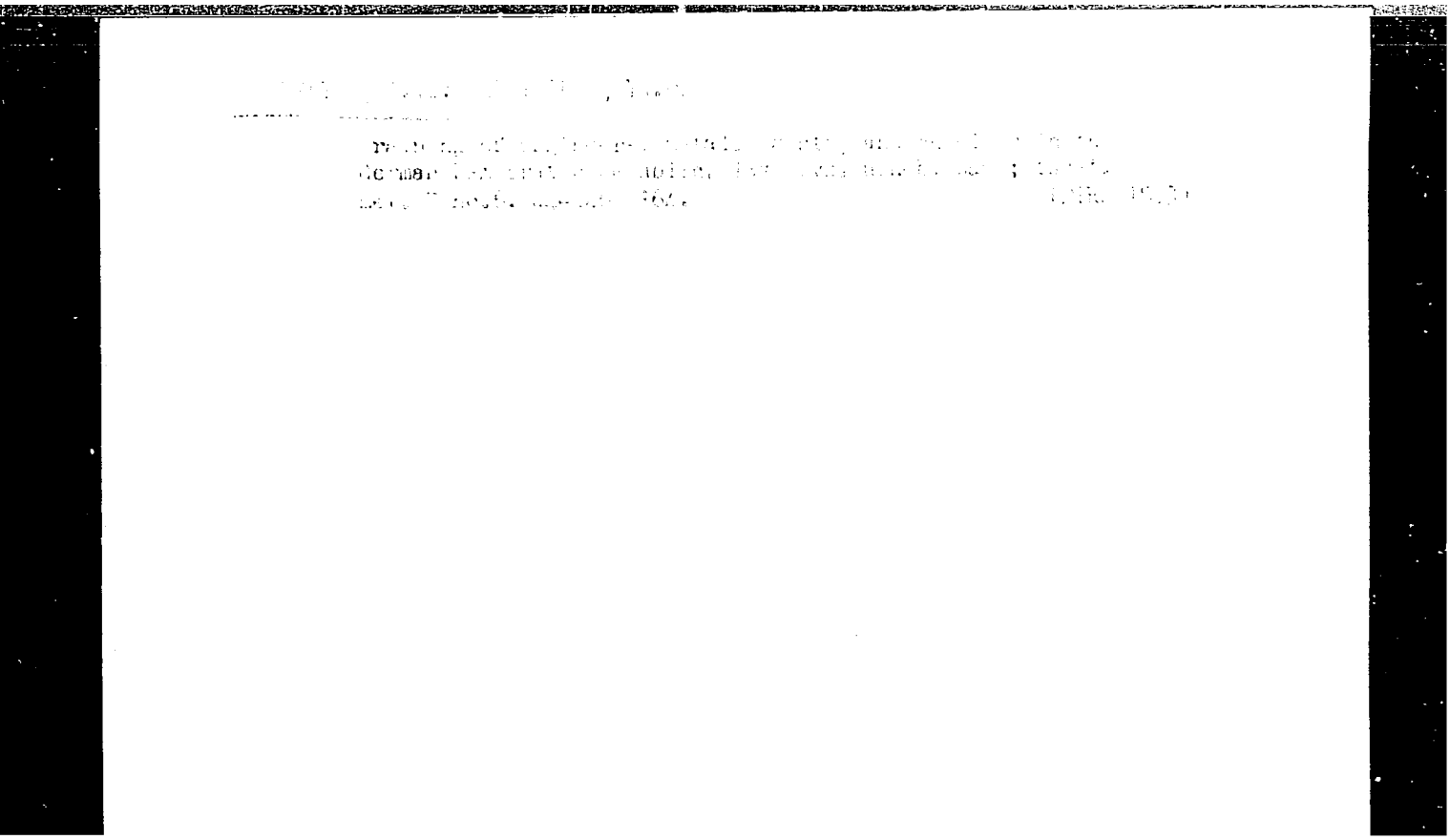

ACCESSION NR: AP4036836 S/0286/64/000/009/0077/0077

AUTHOR: Belyayev, A. I.; Fisher, A. Ya.; Nikitin, A. G.

TITLE: A method for affinage of aluminum alloys of metallic impurities. Class 40, No. 162323

SOURCE: Byul. izobr. i tovar. znakov, no. 9, 1964, 77

TOPIC TAGS: aluminum, aluminum alloy, purification, refining, affinage, aluminum alloy purification, aluminum alloy refining, aluminum alloy affinage, aluminum alloy impurity, metal impurity refining, metal impurity

ABSTRACT: This author's certificate introduces a method for affinage of aluminum alloys of metallic impurities, for example magnesium and iron, by precipitation of the ferrous component of the magnesium impurity and removing it by filtration with subsequent retreatment of the filtrate. In order to produce high grade aluminum and magnesium alloys, the filtrate which is obtained is subjected to electrolytic affinage in an electrolyte of molten salts which contain magnesium ions.

2. A method of this description in which the filter-residuum is treated after filtration of the alloy in a molten salt electrolyte which contains magnesium ions in

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ACCESSION NR: AP4036836

order to increase the magnesium extraction.

3. A method of this description in which the raw aluminum alloy is directly subjected to electrolytic treatment in an electrolyte of molten slats which contain magnesium ions in order to prevent an excess of magnesium.

ASSOCIATION: none

SUBMITTED: 25Jan63	DATE ACQ: 02Jun64	ENCL: 00
SUB CODE: MM	NO REF SOV: 000	OTHER: 000

Card 2/2

L 01797-66 EWT(m)/EWP(t)/EWP(b) IJP(c) JD

ACCESSION NR: AP5021496 UR/0370/65/000/004/0092/0096
669.2/8.43

AUTHOR: Kazakov, A. P. (Moscow); Belyayev, A. I. (Moscow); Vigdorovich, V. N. (Moscow)

TITLE: Purification of magnesium by zone refining

SOURCE: AN SSSR. Izvestiya. Metally, no. 4, 1965, 92-96

TOPIC TAGS: magnesium, metal zone refining, metal purification

ABSTRACT: Highly pure magnesium is needed more and more in atomic power engineering, semiconductor technology and other branches of science and technology. The authors examine the behavior of impurities in magnesium during purification by the zone refining method. The distribution factors for impurities in magnesium are briefly analyzed theoretically. The distribution of aluminum, copper, silicon and iron impurities in magnesium is studied experimentally. The zone refining was done at rates of 0.22, 0.35, 0.70 and 1.05 mm/min. The experimental setup is shown in fig. 1 of the Enclosure. The effective distribution factor of the impurities was studied as a function of the rate of motion of the melted zone (f) after various

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ACCESSION NR: AP5021496

numbers of passes (n). The results of this study are given in table 1 of the Enclosure. Orig. art. has: 5 figures, 2 tables.

ASSOCIATION: none

SUBMITTED: 01Dec64 ENCL: 02 SUB CODE: MM

NO REF SOV: 002 OTHER: 010

Card 2/4

L 01797-66

ACCESSION NR: AP5021496

ENCLOSURE: 01

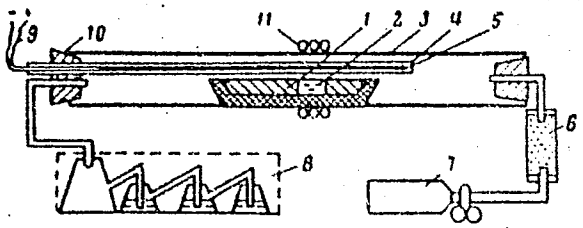

Fig. 1. Diagram of the experimental setup for zone refining of magnesium: 1--ingot; 2--melted zone; 3--quartz tube; 4--protective cover for the thermocouple; 5--thermocouple; 6--drier with silicagel; 7--tank with sulfur dioxide; 8--filter system; 9--thermocouple; 10--stopper; 11--heater

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L 01797-66

ACCESSION NR: AP5021496 ENCLOSURE: 02

TABLE 1

Effect of the rate of motion of the melted zone on the distribution of Al, Si and Cu impurities in magnesium after zone refining with various numbers of passes

f, mm/min	n	Impurity content $\times 10^4$ in various sections along the magnesium sample in mm.														
		Al					Si					Cu				
		10	45	80	115	150	10	45	80	115	150	10	45	80	115	150
0.22	2	25	25	30	35	51	<8	<8	<8	<8	10	2.0	4.8	6	7	110
	3	25	22	22	27	58	<8	<8	<8	9	10	<0.8	1.5	1.5	2.5	0.97
0.35	2	20	30	30	34	46	<8	<8	<8	24	100	2	5	9	21	132
	3	25	23	25	26	48	<8	<8	<8	<8	84	<0.8	1.0	2	9	170
0.70	2	36	41	38	38	49	<8	10	19	22	64	15	35	33	50	110
	3	32	34	35	38	58	<8	<8	9	14	92	9	10	10	25	110
	4	30	34	31	38	60	<8	<8	8	11	87	1.8	2	4	9.1	150
1.05	3	37	34	37	40	46	10	21	30	39	120	5	29	32	71	110
	4	33	34	34	37	45	8	10	19	28	145	2	8	19	60	170

Card 4/4

VOL'BERG, A.A. (Moskva); ADLER, Yu.P. (Moskva); BELYAYEV, A.I. (Moskva);
Prinimali uchastiye: IVANOV, M.A.; SLESAREV, Yu.S., tekhnolog.

Electroconductivity of an electrolyte in respect to its composition and method of feeding with alumina in industrial aluminum baths. Izv. AN SSSR. Met. no.3:26-33 My-Je '65. (MIRA 18:7)

1. Nachal'nik vtorogo uchastka elektroliznogo tsekha Ural'skogo aluminiyevogo zavoda (for Ivanov).

DELIMARSKIY, Yuriy Konstantinovich; MARKOV, Boris Fedorovich; BELYAYEV, A.I., red.; EL'KIND, L.M., red.izd-va; MIKHAYLOVA, V.V., tekhn.red.

[Electrochemistry of fused salts] Elektrokhimiia rasplavlennykh solei. Moskva, Gos.nauchno-tekhn.izd-vo lit-ry po chernoi i tsvetnoi metallurgii, 1960. 325 p. (MIRA 14:1)
(Salts) (Electrochemistry)

L 26455-66 EWT(l)/EWT(m)/T/EWP(t) IJP(c) GG/JD

ACC NR: AP6017367 SOURCE CODE: UR/0363/66/002/003/0409/0412

AUTHOR: Pelevin, O. V.; Voronkov, V. V.; Mil'vidskiy, M. G.; Belyayev, A. I.

ORG: Giredmet

TITLE: Distribution of volatile impurities in growing crystals by oriented crystallization

SOURCE: AN SSSR. Izvestiya. Neorganicheskiye materialy, v. 2, no. 3, 1966, 409-412

TOPIC TAGS: crystal growing, semiconducting material, crystallization, single crystal, impurity level

ABSTRACT: Inasmuch as alloying of crystals of decomposed semiconductor compounds are usually conducted with volatile impurities, and many impurities form stable compounds with one of the basic components, it was of interest to examine the distribution of volatile impurities in crystals grown by oriented crystallization in the presence of the condensed phase of such a compound. The conditions necessary for obtaining alloyed single crystals with equal distribution of the impurity are analyzed. Orig. art. has: 14 formulas. [JPRS]

SUB CODE: 20 / SUBM DATE: 19Aug65 / OTH REF: 001

Card 1/1 UDC: 548.55

L 33488-66 EWT(m)/EWP(t)/ETI IJP(c) JD

ACC NR: AP6012732 SOURCE CODE: UR/0136/66/000/004/0084/0086

AUTHOR: Belyayev, A. I.; Fisher, A. Ya.; Nikitin, A. G.

ORG: none

TITLE: Liquation-electrolytic method of refining aluminum alloys

SOURCE: Tsvetnyye metally, no 4, 1966, pp 84-86

TOPIC TAGS: aluminum alloy, magnesium alloy, electrolytic refining, filtration/V95 aluminum alloy, MGS5 magnesium alloy

ABSTRACT: The Al alloys melted from scrap and wastes usually contain a high Fe content which must be reduced to (for most of the deformable alloys) 0.3-0.5% before they can be fit for use. This is usually accomplished by the magnesium method of refining, which, however, has inherent technical limitations. In this connection, the authors discuss a modification of this method, which they first had patented in 1964 (A. I. Belyayev, A. Ya. Fisher, A. G. Nikitin, Byull. izobr. 1964, no 9, avt. svid. 162323), based on the electrolytic separation of Mg on the principle that the electrode potential of Mg is more electronegative than that of Al and other components of the alloy. The following optimal process parameters have been experimentally determined:

Card 1/4 UDC: 669.715.47

ACC NR: AP6012732

electrolyte composition (in wt.%): 10-18 $MgCl_2$, 35-50 KCl, 35-40 NaCl, 10-20 $BaCl_2$ and 1-2 CaF_2; electrolysis temperature 700-720°C; cathode and anode current density 1 a/cm^2. During the electrolysis a nearly total (up to 99.95%) recovery of Mg from the anodic alloy is possible. The possibility of the electrolytic separation of Mg from the filter-residues of magnesium refining is also established. The complete cycle of refining reduces the impurity content as follows (in %): Fe, from 1.0-2.5 to 0.05-0.3; Si, from 0.9-1.0 to 0.15-0.25; Ni, from 0.5 to 0.25-0.40; Mn, from 0.4 to 0.15-0.20; the content of Cu and Zn remains the same. The Mg separated at the cathode is retreatable (Fig. 1). The advantages of the liquation-electrolysis method compared with the conventional refining by means of Mg are as follows: 1) the electrolyzers operate continuously, by contrast with vacuum furnaces, thus assuring a higher productivity and hence also lower capital investments and lower manpower and overhead expenditures; 2) consumption of hydrogen is eliminated; the electrolyzers can be tended without any risk of explosion; 3) by contrast with the Mg condensate of vacuum furnaces, cathodic Mg may, after treatment, be utilized as a Mg alloy (MGS5) or metal. Economic calculations show that the production cost of the deformable Al alloys produced by this method from low-grade secondary raw materials is 55% lower than the production of the same alloys melted from primary Al. The electrolytic separation of Mg from the alloys is more economical than the currently practiced elimination of Mg

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L 33488-66

ACC NR: AP6012732

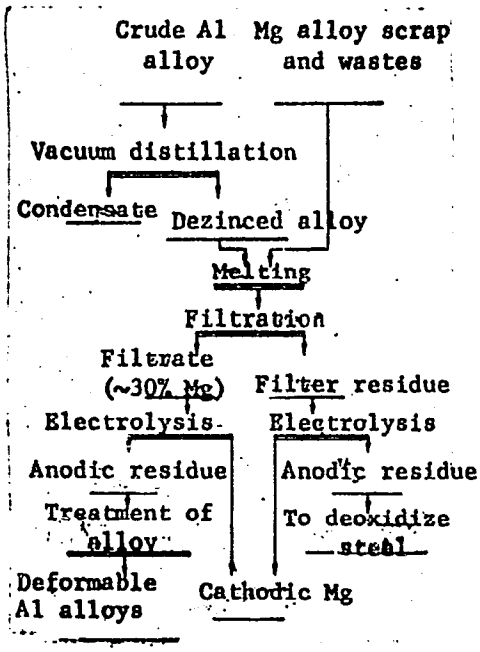

Fig. 1. Flowsheet of the combined method of refining crude Al alloys

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L 33488-66

ACC NR: AP6012732

3

by treating the alloys with cryolite, and it also is applicable to high-Zn deformable Al alloys of the V95 type as well as to Al alloys containing >1% Si which normally cannot be refined by the Mg method. Orig. art. has: 1 figure, 1 table

SUB CODE: 11, 13/ SUBM DATE: none/ ORIG REF: 004/ OTH REF: 002

Card 4/4 92

L 11179-67 EWT(m)/EWP(t)/ETI IJP(c) GD

ACC NR: AP6031726 SOURCE CODE: UR/0370/66/000/005/0169/0176

AUTHOR: Petrusevich, I. V. (Moscow); Nisel'son, L. A. (Moscow); Belyayev, A. I. (Moscow); Gurevich, M. A. (Moscow)

ORG: None

TITLE: On the problem of producing titanium silicides by simultaneous hydrogen reduction of titanium and silicon tetrachlorides

SOURCE: AN SSSR. Izvestiya. Metally, no. 5, 1966, 169-176

TOPIC TAGS: silicide, chemical reduction, titanium compound, chloride, silicon compound, metal purification

ABSTRACT: The article is a continuation of a previous paper on production of titanium silicides by simultaneous hydrogen reduction of titanium and silicon tetrachlorides (Petrusevich, I. V., Nisel'son, L. A., Belyayev, A. I., "On the Production of Titanium Silicides by Simultaneous Hydrogen Reduction of Titanium and Silicon Tetrachlorides", Izv. AN SSSR, Metally, 1965, No 5, 55-57). $TiSi_2$ was deposited on a heated Ta filament 0.7 mm in diameter under the following conditions: $SiCl_4$:$TiCl_4$ ratio in the initial vapor-gas mixture--2:1; hydrogen excess--2200%; rate of hydrogen flow--0.8 l/min and filament temperature--1190-1200°C. A dense silicide deposit was formed with a uniform diameter at a rate of 0.15 g/cm^2·hr or 0.3 mm/hr for radial growth rate. The yield of

Card 1/2 UDC: 669.295.311

ACC NR: AP6031726

$TiSi_2$ was 8% which is lower than the yield in a tubular reactor by a factor of 5.5. The resultant precipitation rate in a filament reactor corresponds satisfactorily with the maximum differential precipitation rate in a tubular reactor. The results indicate that the precipitation rate is limited by the diffusion resistance of the layer adjacent to the heated precipitation surface. It is experimentally shown that the heated surface has a considerable effect on hydrogen reduction of volatile halides from the gaseous phase. Analysis showed that the precipitate had a single-phase microstructure throughout the entire length of the specimen. The silicide showed a uniform microhardness of 780 kg/mm^2 indicating a homogeneous alloy in the principal region of the precipitation zone. These data were confirmed by x-ray structural analysis. Extensive changes in the composition of the initial halide mixture result in considerably smaller variations in the composition of the precipitated alloy. Orig. art. has: 3 figures, 3 tables.

SUB CODE: 11/ SUBM DATE: 24May65/ ORIG REF: 004
07/

ACC NR: AP7002862 SOURCE CODE: UR/0149/66/000/006/0079/0085

AUTHORS: Kazakov, A. P.; Belyayev, A. I.; Vigdorovich, V. N.

ORG: Moscow Institute for Steel and Alloys, Department of Manufacture of Pure Metals and Semiconductor Materials (Moskovskiy institut stali i splavov. Kafedra proizvodstva chistykh metallov i poluprovodnikovykh materialov)

TITLE: Investigation of conditions for zone recrystallization of magnesium

SOURCE: IVUZ. Tsvetnaya metallurgiya, no. 6, 1966, 79-85

TOPIC TAGS: magnesium, copper, aluminum, silicon, metal recrystallization, metal purification, metal zone refining

ABSTRACT: The conditions for zone recrystallization of magnesium were studied, supplementing the results of A. P. Kazakov, A. I. Belyayev, and V. N. Vigdorovich (Izv. AN SSSR, Metally, No. 4, 92, 1965). The experimental procedure followed is described by V. Dzh. Pfann (Zonnaya plavka. Metallurgizdat, 1960). The dependence of the effective distribution coefficients of Al, Cu, and Si impurities in zone-refined Mg was studied as a function of the recrystallization rate. The experimental results are presented in graphs and tables (see Fig. 1). The following relationship between the effective distribution coefficient K and the crystallization rate f was observed

$$\lg\left(\frac{1}{\kappa_{Al}-1}\right)=0{,}61\,f+0{,}363,$$

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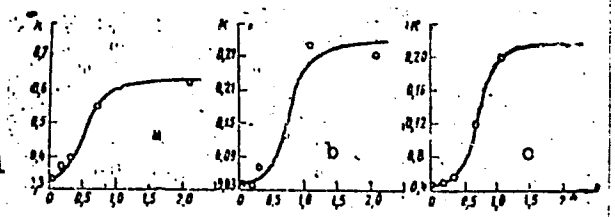
UDC: 669.721

ACC NR: AP7002862

$$\lg\left(\frac{1}{\kappa_{Si}-1}\right)=0{,}977f+1{,}457,$$

$$\lg\left(\frac{1}{\kappa_{Cu}-1}\right)=0{,}801f+1{,}403..$$



Zone displacement, mm/min

Fig. 1. Dependence of effective distribution coefficients of Al (a), Si (b), and Cu (c) impurities in Mg on the zone displacement rate. The three points shown in the graph correspond to the experimental data of A. S. Yue and I. B. Clark (Trans AIME, v. 211, No. 6, 881, 1958)

The concentration dependence of the effective distribution coefficients of Al, Cu, and Si impurities was studied in the concentration range of 10^{-1} to 10^{-3}%, and the experimental results are tabulated. The rate of corrosion of zone-refined Mg was compared with that of distilled Mg. It was found that zone-refined Mg was identical in its corrosion behavior, with respect to HCl and KCl solutions, with that of fractionally distilled Mg. The experimental results are shown graphically. On the basis of the experimental results and literature data, a scheme is proposed for the classification of the effect of impurities on the purity of zone-refined Mg. Orig. art. has: 2 tables, 6 graphs, and 5 equations.

Card 2/2 SUB CODE: 11/ SUBM DATE: 080ct65/ ORIG REF: 005/ OTH REF: 002

BELYAYEV, A.I., inzh. (Petropavlovsk)

How damage to the diesel locomotive and request for its replacement could have been prevented. Elek.i tepl.tiaga 6 no.4:23-24 Ap '62. (MIRA 15:5)
(Diesel locomotives)